MEMS Reaction Control and Maneuvering for Picosats beyond LEO

Completed Technology Project (2015 - 2017)

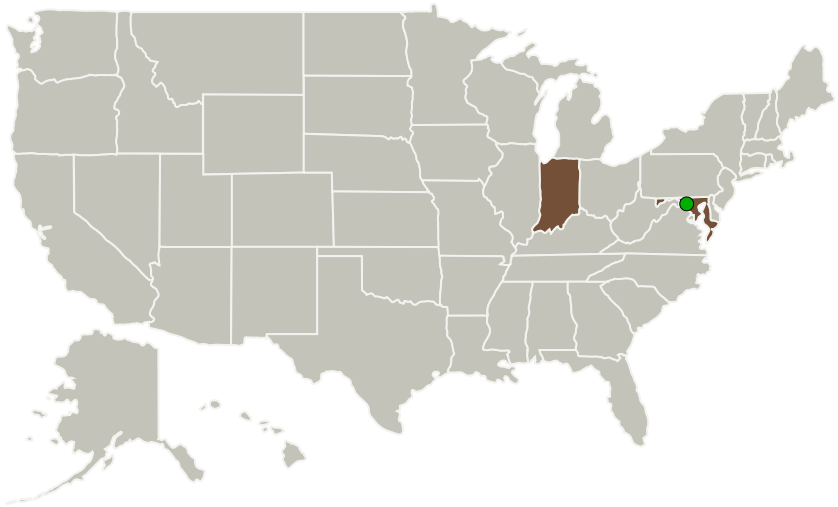
Project Introduction

This project further develops a multi-functional SmallSat technology for low-power attitude control of picosatellites beyond low Earth orbit. The film-evaporation MEMS tunable array (FEMTA) concept utilizes a green propellant and microscale effects in fluid surface tension and advanced MEMS microfabrication to achieve thrust under 0.1 W of power and within 0.1 U total system volume. Interplanetary CubeSats can utilize FEMTA for high slew rate attitude corrections in addition to desaturating reaction wheels. The FEMTA in cooling mode can be used for thermal control during high-power communication events, which are likely to accompany the attitude correction.

Anticipated Benefits

Once developed, interplanetary CubeSats or picosatellites can utilize FEMTA's low-power attitude control for high slew rate attitude corrections in addition to desaturating reaction wheels. The FEMTA in cooling mode can be used for thermal control during high-power communication events, which are likely to accompany the attitude correction.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Purdue University-Main Campus	Lead Organization	Academia	West Lafayette, Indiana
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Indiana	Maryland

Project Transitions

October 2015: Project Start

October 2017: Closed out

Closeout Summary: Demonstrated in lab, a 1U 1-axis attitude control capabilit y with >360º rotation at < 0.2 W with average thrust-power of 400 µN/Watt, de signed bimorph electrothermal microshutters at < 10 mW input, and integrated ADCS.

Project Website:

https://www.nasa.gov/directorates/spacetech/home/index.html

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Purdue University-Main Campus

Responsible Program:
Small Spacecraft Technology

Project Management

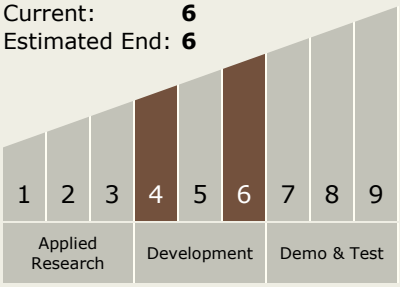
Program Director:
Christopher E Baker

Program Manager:
Roger Hunter

Principal Investigator:
Alina Alexeenko

Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



Target Destination

Earth